Objectives and Evaluation Criteria for Great Lakes Health Advisories: Perspectives from Fishery, Health, and Environmental Quality Agencies

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ABSTRACT

The eight Great Lakes states issue health advisories to reduce human exposure to potentially harmful chemicals in Great Lakes fish. Although the health agency in each jurisdiction is the lead agency for developing health advisory criteria, fishery management and environmental quality agencies are also involved in the health advisory process. Differences exist among these agencies regarding the development and communication of health advisories. Our objectives were to identify (1) the objectives agencies hold for health advisories, (2) concerns about the communication process, and (3) criteria for evaluating successful advisories. We conducted a telephone interview with each of the health, environmental quality, and/or fishery agency representatives (n = 27) in each state with responsibility for health advisories to determine agency objectives, concerns, and evaluation criteria. Although some objectives were held almost universally by the agencies studied, many objectives held differed by type of agency and by state. Agencies differed on the importance assigned to reducing health risks in various subpopulations, the priority placed on encouraging support for pollution clean-up programs, the importance of meeting agency mandates, and the priority placed on encouraging support for fishery management and the enjoyment of sport-fishery resources. Fewer differences existed between agencies regarding evaluation criteria. Most respondents indicated consistency among agencies in their health advisory processes was desirable. Adopting a common set of objectives would be a major step toward implementing a common health advisory process.

INTRODUCTION

In May, 1986, the Governors of New York, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Wisconsin, and Minnesota committed their states to developing a process that would more closely coordinate the issuance of fish consumption advisories for Lakes Ontario, Erie, Huron, Michigan, and Superior. The Great Lakes Fish Consumption Advisory Task Force was created to work toward: (1) common advisory criteria; (2) common advisories on a lake-by-lake basis where regional differences in contamination levels are not apparent; and (3) more balanced and effective communication with the public (Hesse 1990).

The overall goal of the Task Force is to reduce human exposure to potentially harmful chemicals (Hesse 1990). Even with a shared goal, however, the specific objectives states hope to achieve with health advisories may differ among the jurisdictions. These may involve both inter-state and intra-state differences. Although the health agency in each jurisdiction is designated as the lead agency for developing health advisory criteria (Hesse 1990), the fishery management and environmental quality agencies become involved in sampling and monitoring activities, advisory communication, and as contact points with the public. Differences among these agencies in identifying the primary objectives and purposes for health advisories may contribute to the differences in approaches evident in determining advisory criteria, developing advisories for the same lake, and communicating with the public (Knuth 1989, 1991).

The study reported here was the first part of a larger project sponsored by the Great Lakes Protection Fund that focused on evaluating the communication of health advisories in the Great Lakes Basin. Our objectives for this first study were to: (1) identify the objectives that agencies hold for fish consumption advisories in the Great Lakes region; (2) identify the concerns that agencies have regarding the health advisory communication process; and (3) identify criteria that could be used for evaluating the success of health advisories. This study was followed by a second study that included a mail survey of 8,000 licensed anglers throughout the Great Lakes Basin to evaluate the risk communication process associated with health advisories. Results from the second study will be available in a later report.

METHODS

We identified 3-4 individuals in each state who had major responsibilities associated with health advisories. This included 1 state health agency representative identified by Cunningham et al. (1990) as the person with major responsibility for health advisories in each state, 1 environmental quality agency representative identified by Cunningham et al. (1990) as the major agency contact in each state, and 1-2 fishery professionals in each state. The fishery professionals identified included the individual with major oversight responsibility for the state fisheries program and the individual with major Great Lakes oversight responsibilities. We also identified representatives from other organizations with some interest and/or influence in the health advisory process, including individuals from the Great Lakes Fishery Commission, National Wildlife Federation, Great Lakes United, American Fishing Tackle Manufacturer's Association, and the Sport Fishing Institute. This report contains results mainly from interviews with state agency representatives but includes information from these other organizations where comparisons are useful.

We mailed each individual identified as having major responsibility for health advisories a letter explaining the research project and requesting their participation in a phone interview which would focus on health advisory objectives, strengths and weaknesses of health advisory communication efforts, and opinions about criteria for evaluating the success of health advisories. We indicated the information was to be used to develop a mail questionnaire which would be sent to a sample of licensed anglers throughout the Great Lakes Basin.

Phone interviews were conducted in May and June, 1991. We made an initial call and up to 4 call-backs if the initial and subsequent contacts were inconvenient for the respondent. If an individual indicated s/he no longer had health advisory responsibilities, we asked for the name of the person who had replaced her/him in that position. The interview lasted about 15 minutes and included closed- and open-ended questions about objectives for advisories, positive and negative aspects of advisories, concerns and suggestions for improvement, and evaluation criteria.

RESULTS

We completed 35 phone interviews with 13 fishery professionals, 7 health agency representatives, 7 environmental quality agency representatives, and 8 individuals from the other organizations noted above. Agency individuals included 4 from New York, 4 from Pennsylvania, 2 from Ohio, 4 from Michigan, 4 from Indiana, 3 from Illinois, 3 from Wisconsin, and 3 from Minnesota.

Health Advisory Objectives

Of 20 objectives presented to respondents, the most important objectives for states overall included those focused on allowing people to make their own informed decisions including selecting fish preparation methods and less-contaminated fish species, and reducing health risks to the public, licensed and unlicensed anglers, subsistence fishers, and special at-risk groups of people (Table 1). Reducing risks for recipients of "gift-fish" was a lower priority overall. Moderate priority objectives included those focused on motivating people to work toward Great Lakes pollution control and/or clean-up, and meeting legal agency mandates (Table 1). Less important objectives overall included those focused on encouraging public support for fishery management,

Table 1. Objectives for health advisories identified by representatives from state health, fishery, and environmental quality agencies, and the Great Lakes Fishery Commission (n=28), including means, standard deviations, and frequencies of responses.

Objectives	Mean	Standard Deviation	Not Imp.	Somewhat Imp.	Important	Very Imp.	Extremely Imp.
			%				
To allow people to make their own, informed decision about eating Great Lakes fish.	4.7	0.6	0.0	0.0	7.1	14.3	78.6
To reduce health risks to special at-risk groups of people.	4.6	0.6	0.0	0.0	7.1	21.4	71.4
To reduce public health risks.	4.5	0.7	0.0	0.0	10.7	32.1	57.1
To reduce health risks to licensed sport anglers.	4.5	0.6	0.0	0.0	7.1	39.3	53.6
To help people select risk-reducing fish cleaning and cooking methods.	4.3	0.8	0.0	3.6	10.7	35.7	50.0
To reduce health risks to those people who rely on fish as a subsistence food resource.	4.3	1.0	3.6	0.0	14.3	25.0	57.1
To help people select lesser contaminated species of fish to eat.	4.2	0.8	0.0	0.0	21.4	35.7	42.9
To reduce health risks to unlicensed anglers.	3.9	1.0	3.6	0.0	35.7	25.0	35.7
To motivate people to keep their consumption of sport-caught fish within the levels listed in the advisory.	3.8	1.1	3.7	3.7	29.6	29.6	33.3
To inform people about the safe species and/or locations to fish within the Great Lakes.	3.8	1.1	3.7	7.4	22.2	37.0	29.6
To reduce health risks to fish-eating, but non-angling, recipients of "gift fish."	3.6	1.1	3.6	10.7	28.6	35.7	21.4
To encourage public support for programs to reduce or clean up toxic contamination in the Great Lakes.	3.0	1.3	18.5	14.8	33.3	14.8	18.5
To motivate people to take action to clean up or stop Great Lakes pollution.	2.6	1.3	25.9	22.2	25.9	14.8	11.1
To meet legal mandates of government agencies.	3.1	1.5	25.9	3.7	29.6	18.5	22.2
To encourage public support for Great Lakes fishery management.	2.6	1.6	39.3	10.7	17.9	14.3	17.9
To inform people about the health benefits that may be associated with eating fish.	2.9	1.2	14.3	21.4	32.1	25.0	7.1
To encourage enjoyment of sport-fishery resources.	2.7	1.5	25.0	25.0	21.4	7.1	21.4

Table 1 (continued)

Objectives	Mean	Standard Deviation	Not Imp.	Somewhat Imp.	Important	Very Imp.	Extremely Imp.
					%		
To encourage beneficial uses of sport-fishery resources.	2.7	1.4	25.0	25.0	25.0	7.1	17.9
To protect tourism-based economies from sudden changes or losses.	2.1	1.3	50.0	14.3	17.9	10.7	7.1
To discourage people from eating Great Lakes fish.	1.3	0.8	78.6	17.9	0.0	0.0	3.6

enjoyment of sport-fisheries, protecting local economies, and informing people about the health benefits of fish consumption (Table 1).

State agencies differed in importance placed on these objectives, however, by both agency responsibility (Table 2) and by state (Table 3). All agencies considered allowing people to make their own informed decisions and reducing health risks to special at-risk populations as being among the top priorities (Tables 2 and 3). Agencies differed, however, on the importance assigned to reducing health risks in various subpopulations. Fishery agency chiefs considered reducing health risks to subsistence fishers, unlicensed anglers, and recipients of "gift fish" much higher priorities than did Great Lakes fishery program directors (Table 2). Environmental quality agencies viewed unlicensed anglers as a lower priority than did health agencies (Table 2). Environmental quality agencies assigned a higher priority than did health agencies to helping people select proper fish preparation methods (Table 2).

Fishery program chiefs differed from all other agency representatives on the relatively high priority assigned to encouraging support for programs to reduce or clean up Great Lakes toxics. This high priority was shared by non-governmental organizations (NGO's) affiliated with the fishing industry (4.7 ± 0.6) and NGO's characterized as environmental organizations (5.0 ± 0.0). NGO's, however, went a step farther and rated motivating people to take action to clean up the Great Lakes as very high priorities (4.7 ± 0.6 for industry; 5.0 ± 0 for environmental) compared to the state agencies (Table 2).

Great Lakes fishery program directors were much more concerned about meeting agency mandates than were other agency representatives, including fishery agency chiefs (Table 2). Protecting tourism economies was judged important by Great Lakes fishery program directors (Table 2) and industry NGO's (3.3 ± 0.6).

No state agency sought to discourage people from eating Great Lakes fish (Table 2), although environmental NGO's saw this objective as somewhat important (2.7 ± 1.5). Industry and environmental NGO's differed most strongly on the importance they placed on objectives targeted toward encouraging support for Great Lakes fishery management (5.0 vs. 3.0), encouraging beneficial uses of sport-fishery resources (4.7 vs. 1.0) and informing people about the health benefits from eating fish (5.0 vs. 1.2).

States differed from one another on the importance placed on several objectives (Table 3). Ohio placed relatively less importance than other states on reducing risks to licensed anglers, whereas Michigan placed relatively less importance than other states on reducing risks to unlicensed anglers (Table 3). Ohio placed extremely high importance on informing people about the safe species and/or locations within the Great Lakes (Table 3). Pennsylvania and Illinois placed the highest priority relative to other states on encouraging and motivating public support and action for Great Lakes pollution clean-up efforts (Table 3). Illinois was consistently among the states placing relatively higher priority on objectives associated with encouraging support for fishery management and encouraging enjoyment of sport-fishery resources (Table 3).

A factor analysis was performed to examine the underlying relationships between objectives and reduce the large set of objectives to a smaller set of factors that account for the observed interrelationships in the data. Principal axis factoring with varimax rotation was used on the set of objectives. Two objectives were dropped from this analysis to improve reliability and the percent of variance explained (informing people about health benefits, discouraging people from eating fish). The factor analysis explained 81.6% of the variance in the data. Meaning was assigned to the 5 factors identified by the analysis based on the types of objectives with high factor loadings on each factor (Table 4). The 5 factors included objectives focused on encouraging public support for management and use of fishery resources, reducing health risks, helping people make informed decisions, following agency mandates, and alerting people about proper fish cleaning and cooking procedures (Table 4). A cluster analysis which groups individual respondents into clusters based

Table 2. Health advisory objectives identified by state fishery agency chiefs, Great Lakes fishery program directors, health agencies, and environmental quality agencies, including means and standard deviations.

Objectives	Fish Chiefs	Fish GL Heads	Health	Env. Quality
	Mean (standard deviation)			
To allow people to make their own, informed decision about eating Great Lakes fish.	4.8(0.4)	5.0(0.0)	4.6(0.8)	4.6(0.8)
To reduce health risks to special at-risk groups of people.	4.8(0.4)	4.4(0.8)	4.7(0.5)	4.6(0.8)
To reduce public health risks.	4.7(0.5)	4.0(1.0)	4.6(0.5)	4.6(0.5)
To reduce health risks to licensed sport anglers.	4.7(0.5)	4.3(0.9)	4.4(0.5)	4.4(0.5)
To help people select risk-reducing fish cleaning and cooking methods.	4.3(0.8)	4.4(0.8)	4.1(0.7)	4.7(0.5)
To reduce health risks to those people who rely on fish as a subsistence food resource.	4.8(0.4)	3.4(1.4)	4.6(0.5)	4.4(0.8)
To help people select lesser contaminated species of fish to eat.	4.0(1.1)	4.1(0.7)	4.4(0.8)	4.3(0.7)
To reduce health risks to unlicensed anglers.	4.3(0.8)	3.6(1.5)	4.1(0.7)	3.4(0.8)
To motivate people to keep their consumption of sport-caught fish within the levels listed in the advisory.	3.8(1.6)	3.8(0.9)	3.7(0.8)	4.2(1.7)
To inform people about the safe species and/or locations of fish within the Great Lakes.	3.8(1.6)	3.8(0.7)	3.6(1.1)	4.0(1.0)
To reduce health risks to fish-eating, but non-angling, recipients of "gift fish."	4.0(0.9)	3.0(1.5)	3.6(0.5)	3.7(0.9)
To encourage public support for programs to reduce or clean up toxic contamination in the Great Lakes.	4.0(1.7)	3.3(1.2)	2.4(0.8)	2.2(1.2)
To motivate people to take action to clean up or stop Great Lakes pollution.	3.5(1.5)	2.8(1.5)	1.7(0.7)	2.3(1.0)
To meet legal mandates of government agencies.	1.8(1.3)	4.3(0.9)	3.0(1.4)	2.8(1.5)
To encourage public support for Great Lakes fishery management.	3.5(2.0)	3.3(1.7)	2.0(1.0)	1.6(0.8)
To inform people about the health benefits that may be associated with eating fish.	2.8(1.6)	3.0(0.8)	3.4(1.0)	2.4(1.3)
To encourage enjoyment of sport-fishery resources.	3.7(2.1)	3.3(1.5)	2.1(0.7)	1.8(0.9)
To encourage beneficial uses of sport-fishery resources.	3.5(2.0)	3.1(1.7)	2.3(0.5)	1.8(0.9)
To protect tourism-based economies from sudden changes or losses.	2.2(1.2)	3.1(1.7)	1.6(1.1)	1.4(0.8)
To discourage people from eating Great Lakes fish.	1.3(0.5)	1.0(0.0)	1.1(0.4)	1.8(1.5)

Table 3. Health advisory objectives identified by agency representatives, grouped by state, including means and standard deviations.

Objectives	NY	PA	OH	MI	IN	IL	WI	MN
	Mean (Standard deviation)							
To allow people to make their own, informed decision about eating Great Lakes Fish.	4.7 (0.5)	4.5 (1.0)	5.0 (0.0)	4.7 (0.5)	4.5 (1.0)	4.7 (0.6)	5.0 (0.0)	5.0 (0.0)
To reduce health risks to special at-risk groups of people.	4.7 (0.5)	4.5 (0.6)	4.5 (0.7)	4.0 (1.1)	4.5 (0.6)	5.0 (0.0)	5.0 (0.0)	5.0 (0.0)
To reduce public health risks.	4.0 (0.8)	5.0 (0.0)	3.5 (0.7)	4.2 (0.9)	4.2 (0.5)	5.0 (0.0)	5.0 (0.0)	4.3 (0.6)
To reduce health risks to licensed sport anglers.	4.5 (0.6)	4.5 (0.6)	3.5 (0.7)	4.2 (1.0)	4.2 (0.5)	5.0 (0.0)	5.0 (0.0)	4.3 (0.6)
To help people select risk-reducing fish cleaning and cooking methods.	4.0 (0.8)	4.2 (1.0)	5.0 (0.0)	4.7 (0.5)	4.2 (0.5)	4.7 (0.6)	5.0 (0.0)	3.7 (0.6)
To reduce health risks to those people who rely on fish as a subsistence food resource.	4.0 (0.8)	4.2 (1.0)	4.0 (1.4)	4.0 (2.0)	4.2 (0.5)	4.3 (1.1)	4.7 (0.6)	5.0 (0.0)
To help people select lesser contaminated species of fish to eat.	4.5 (1.0)	3.5 (0.6)	4.5 (0.7)	4.0 (1.1)	4.0 (0.8)	4.7 (0.6)	5.0 (0.0)	4.0 (0.0)
To reduce health risks to unlicensed anglers.	4.0 (0.8)	4.0 (1.1)	4.0 (1.4)	3.0 (1.6)	4.0 (0.8)	4.0 (1.0)	4.0 (1.0)	4.0 (1.0)
To motivate people to keep their consumption of sport-caught fish within the levels listed in the advisory.	3.5 (1.7)	3.7 (1.0)	3.0 (0.0)	3.2 (1.0)	4.2 (1.0)	4.3 (1.1)	5.0 (0.0)	3.7 (0.6)
To inform people about the safe species and/or locations to fish within the Great Lakes.	3.7 (1.0)	3.7 (1.2)	5.0 (0.0)	3.0 (1.4)	3.2 (1.3)	4.0 (1.4)	4.3 (0.6)	4.3 (0.6)
To reduce health risks to fish-eating, but non-angling, recipients of "gift fish".	3.2 (1.0)	3.7 (1.0)	3.5 (0.7)	3.0 (1.6)	3.7 (1.0)	3.7 (1.5)	3.3 (1.1)	4.3 (0.6)
To encourage public support for programs to reduce or clean up toxic contamination in the Great Lakes.	2.2 (1.0)	4.0 (1.1)	3.0 (0.0)	2.0 (1.1)	2.7 (1.7)	4.0 (1.0)	3.0 (1.7)	3.0 (1.7)
To motivate people to take action to clean up or stop Great Lakes pollution.	1.7 (1.0)	3.7 (1.5)	3.0 (0.0)	2.0 (0.8)	1.7 (1.0)	3.7 (1.1)	2.3 (1.5)	3.0 (1.7)
To meet legal mandates of government agencies.	3.5 (1.7)	3.2 (1.3)	5.0 (0.0)	2.5 (1.0)	1.5 (1.0)	4.0 (1.0)	2.3 (2.3)	3.5 (0.7)
To encourage public support for Great Lakes fishery management.	1.7 (1.0)	3.7 (1.5)	2.0 (1.4)	1.0 (0.0)	2.7 (2.1)	4.3 (1.1)	2.3 (1.5)	2.7 (1.5)
To inform people about the health benefits that may be associated with eating fish.	2.5 (1.3)	3.2 (1.0)	2.5 (0.7)	1.7 (1.0)	2.7 (1.2)	4.0 (1.0)	4.3 (0.6)	2.7 (0.6)
To encourage enjoyment of sport-fishery resources.	1.5 (0.6)	3.5 (1.9)	3.0 (2.8)	1.2 (0.5)	3.2 (1.5)	3.7 (1.1)	3.0 (1.7)	3.0 (0.0)
To encourage beneficial uses of sport-fishery resources.	1.2 (0.5)	3.7 (1.5)	3.0 (2.8)	1.2 (0.5)	3.2 (1.5)	3.7 (1.1)	3.0 (1.0)	2.7 (0.6)

Table 3 (continued)

Objectives	NY	PA	OH	MI	IN	IL	WI	MN
	Mean (Standard deviation)							
To protect tourism-based economies from sudden changes or losses.	1.0 (0.0)	2.5 (1.9)	3.0 (2.8)	1.0 (0.0)	2.2 (0.5)	3.7 (0.6)	1.3 (0.6)	2.7 (1.5)
To discourage people from eating Great Lakes fish.	2.0 (2.0)	1.0 (0.0)	1.0 (0.0)	1.5 (0.6)	1.2 (0.5)	1.0 (0.0)	1.7 (0.6)	1.0 (0.0)

Table 4. Major factors identified and factor loadings for 18 of 20 objectives rated according to importance by state agencies. (Two objectives, which focused on health benefits from eating fish and discouraging fish consumption were dropped from the analysis to improve reliability and percent of variation explained.)

Objectives	Public Support and Resource Use	Health Risk Reduction	Informed Individual Decisions	Follow Mandates	Risk Reducing Preparation Methods
To allow people to make their own, informed decision about eating Great Lakes fish.			.58		
To reduce health risks to special at-risk groups of people.			.63		
To reduce public health risks.		.88			
To reduce health risks to licensed sport anglers.		.84			
To help people select risk-reducing fish cleaning and cooking methods.					.90
To reduce health risks to those people who rely on fish as a subsistence food resource.		.86			
To help people select lesser contaminated species of fish to eat.			.80		
To reduce health risks to unlicensed anglers.		.62			
To motivate people to keep their consumption of sport-caught fish within the levels listed in the advisory.			.85		
To inform people about the safe species and/or locations to fish within the Great Lakes.				.69	
To reduce health risks to fish-eating, but non-angling, recipients of "gift fish".		.71			
To encourage public support for programs to reduce or clean up toxic contamination in the Great Lakes.	.84				
To motivate people to take action to clean up or stop Great Lakes pollution.	.75				
To meet legal mandates of government agencies.				.87	
To encourage public support for Great Lakes fishery management.	.88				
To encourage enjoyment of sport-fishery resources.	.93				
To encourage beneficial uses of sport-fishery resources.	.92				
To protect tourism-based economies from sudden changes or losses.	.83				

on all variables included in the factor analysis produced two clusters. Fishery agency chiefs, Great Lakes fishery program directors, and the Great Lakes Fishery Commission generally grouped in the first cluster, whereas health agencies and environmental quality agencies grouped primarily in the second cluster. The cluster analysis demonstrated that differences exist in the importance placed on health advisory objectives between fishery agencies and health/environmental quality agencies.

Health Advisory Evaluation Criteria

Respondents rated the importance of 19 possible health advisory evaluation criteria. Among the most important criteria were extent of awareness among anglers about the advisory and about particular species and locations, extent of angler behavior associated with fish preparation methods and sizes and species of fish kept, and fish consumption levels of children, women, and anglers generally (Table 5). Behavior of non-anglers was of slightly lower importance (Table 5). None of the potential evaluation criteria were judged by the group of agencies to be unimportant (based on mean scores), although some criteria such as changes in fishing license sales and reduction in fishing were judged by some as unimportant and by others as extremely important (Table 5).

Agencies differed more in their importance ratings for objectives (discussed previously) than they did in their importance ratings for evaluation criteria. Some differences did exist among agencies, however, based on their importance ratings for evaluation criteria. Catch-and-release fishing was a more important criterion for fishery chiefs and environmental quality agencies than for the other agencies (Table 6). The extent to which anglers change fishing locations was more important for fishery chiefs and Great Lakes program directors than for health and environmental quality agencies (Table 6). Great Lakes fishery program directors were somewhat more concerned about knowing the extent to which children, women, anglers, and other fish consumers reduce their fish consumption far below the levels recommended in the advisory than were other types of agencies (Table 6). Fishing license sales and frequency of fishing were judged more important evaluation criteria by fishery agency chiefs and Great Lakes program directors than by health or environmental quality agencies (Table 6). All agencies placed higher importance on advisory awareness among licensed anglers than among the general public (Table 6).

State comparisons of evaluation criteria importance ratings indicate some differences among states (Table 7). Minnesota's most important evaluation criteria focused on the extent to which women and children maintained fish consumption at advisory levels, whereas other states' most important evaluation criteria focused on extent of angler awareness about the advisories, species, and locations (Table 7). Ohio placed noticeably lower priority on evaluation criteria associated with fish consumption by any population. Only Illinois did not place a higher priority on advisory awareness among anglers than among the general public (Table 7). Most agencies placed a higher importance on knowing the fish consumption rates for women and children rather than for anglers in general (Table 7). Most agencies are more concerned that anglers maintain their fish consumption at or slightly below the advisory recommendations rather than assessing whether consumption is far below the levels in the advisory (Table 7). Several respondents, however, indicated their agencies would be concerned if fish consumption fell far below the recommendations in the advisory because of the health benefits that careful fish consumption provides. Illinois and Wisconsin placed relatively higher priority on fishing license sales than did the other states (Table 7).

A factor analysis of the evaluation criteria was performed using the same methods as were used with the factor analysis of objectives. Three evaluation criteria were dropped from the analysis to improve reliability and the percent variance explained (extent of awareness among the general public, change in fishing license sales, and reduction in fishing frequency). The analysis produced 4 major factors, identified as maintaining fish consumption at recommended advisory levels, reducing fish consumption far below the recommended levels, extent of angler awareness

Table 5. Importance of health advisory evaluation criteria based on responses from all state agency respondents and the Great Lakes Fishery Commission (n=28), including means, standard deviations, and frequencies.

Evaluation Criteria	Mean	Standard Deviation	Not Imp.	Somewhat Imp.	Important	Very Imp.	Extremely Imp.
			%				
Extent of awareness of the advisory among licensed anglers.	4.5	0.7	0.0	0.0	10.7	28.6	60.7
Extent to which anglers are aware if they are fishing for a species with an advisory or not.	4.5	0.8	0.0	3.6	7.1	25.0	64.3
Extent to which anglers are aware if they are fishing in a body of water with an advisory or not.	4.5	0.8	0.0	3.6	10.7	21.4	64.3
Extent of angler use of fish cleaning and cooking methods that may reduce contaminants consumed.	4.4	0.7	0.0	0.0	10.7	35.7	53.6
Extent to which children maintain their fish consumption at or slightly below the levels in the advisory.	4.3	1.0	3.7	0.0	14.8	29.6	51.9
Extent to which anglers change the target species they fish for to avoid those species more likely to accumulate contaminants.	4.3	0.8	0.0	3.6	10.7	39.3	46.4
Extent to which women maintain their fish consumption at or slightly below the levels in the advisory.	4.2	1.0	3.7	0.0	18.5	25.9	51.9
Extent to which anglers change the size of the fish they keep to avoid larger fish more likely to have accumulated contaminants.	4.2	0.9	0.0	7.1	10.7	39.3	42.9
Extent to which anglers maintain their fish consumption at or slightly below the levels in the advisory.	4.0	1.1	3.7	3.7	29.6	18.5	44.4
Extent to which anglers practice catch-and-release fishing instead of keeping the fish to eat when fishing for species affected by contaminants.	3.9	1.1	3.6	7.1	21.4	32.1	35.7
Extent to which other fish consumers (non-anglers) maintain their fish consumption at or slightly below the levels in the advisory.	3.8	1.2	3.7	11.1	25.9	14.8	44.4
Extent to which anglers change the locations they fish to avoid contaminated waters.	3.8	1.1	0.0	14.8	18.5	33.3	33.3
Extent of awareness of the advisory among the general public.	3.7	1.1	0.0	14.3	39.3	10.7	35.7
Extent to which women reduce their fish consumption far below the levels in the advisory.	3.4	1.3	7.4	18.5	29.6	18.5	25.9
Extent to which children reduce their fish consumption far below the levels in the advisory.	3.3	1.3	7.4	22.2	25.9	22.2	22.2
Extent to which anglers reduce their fish consumption far below the levels in the advisory.	3.1	1.3	11.1	22.2	37.0	3.7	25.9
Extent to which other fish consumers (non-anglers) reduce their fish consumption far below the levels in the advisory.	3.0	1.3	11.1	25.9	40.7	0.0	22.2

Table 5 (continued)

Evaluation Criteria	Mean	Standard Deviation	Not Imp.	Somewhat Imp.	Important	Very Imp.	Extremely Imp.
			%				
Extent to which fishing license sales change due to advisory.	2.7	1.6	32.1	17.9	17.9	10.7	21.4
Extent to which anglers reduce their frequency of fishing.	2.6	1.5	35.7	14.3	21.4	14.3	14.3

Table 6. Health advisory evaluation criteria judged important by fishery agency chiefs, Great Lakes fishery program directors, health agencies, and environmental quality agencies, including means and standard deviations.

Evaluation Criteria	Fish Chiefs	Fish GL Heads	Health	Env. Quality
	Mean (Standard Deviation)			
Extent of awareness of the advisory among licensed anglers.	4.7(0.8)	4.7(0.5)	4.1(0.9)	4.6(0.5)
Extent to which anglers are aware if they are fishing for a species with an advisory or not.	4.5(0.8)	4.7(0.5)	4.0(1.1)	4.8(0.4)
Extent to which anglers are aware if they are fishing in a body of water with an advisory or not.	4.5(0.8)	4.6(0.8)	4.0(1.1)	4.8(0.4)
Extent of angler use of fish cleaning and cooking methods that may reduce contaminants consumed.	4.5(0.8)	4.6(0.5)	4.1(0.9)	4.6(0.5)
Extent to which children maintain their fish consumption at or slightly below the levels in the advisory.	4.5(0.8)	4.0(1.4)	4.3(0.7)	4.5(0.8)
Extent to which women maintain their fish consumption at or slightly below the levels in the advisory.	4.5(0.8)	4.0(1.4)	4.1(0.9)	4.5(0.8)
Extent to which anglers change the size of the fish they keep to avoid larger fish more likely to have accumulated contaminants.	4.5(0.8)	4.1(0.9)	4.0(1.0)	4.1(1.1)
Extent to which anglers change the target species they fish for to avoid those species more likely to accumulate contaminants.	4.3(1.2)	4.6(0.5)	4.1(0.7)	4.1(0.9)
Extent to which anglers maintain their fish consumption at or slightly below the levels in the advisory.	4.3(1.0)	3.7(1.5)	3.7(0.9)	4.2(1.2)
Extent to which anglers practice catch-and-release fishing instead of keeping the fish to eat when fishing for species affected by contaminants.	4.3(1.0)	3.6(1.6)	3.6(0.5)	4.1(1.1)
Extent to which anglers change the locations they fish to avoid contaminated waters.	4.0(1.3)	4.5(0.5)	3.4(1.0)	3.6(1.3)
Extent of awareness of the advisory among the general public.	3.8(1.3)	4.0(1.3)	3.3(0.7)	3.8(1.0)
Extent to which other fish consumers (non-anglers) maintain their fish consumption at or slightly below the levels in the advisory.	4.2(1.3)	3.7(1.5)	3.6(1.1)	4.2(1.2)
Extent to which children reduce their fish consumption far below the levels in the advisory.	3.0(0.9)	3.8(1.5)	2.7(1.1)	3.8(1.3)
Extent to which women reduce their fish consumption far below the levels in the advisory.	3.0(0.9)	3.9(1.5)	2.8(1.3)	3.8(1.3)
Extent to which anglers reduce their fish consumption far below the levels in the advisory.	3.0(1.1)	4.0(1.5)	2.3(0.7)	3.3(1.5)
Extent to which other fish consumers (non-anglers) reduce their fish consumption far below the levels in the advisory.	2.8(1.2)	3.6(1.5)	2.3(0.7)	3.2(1.6)
Extent to which fishing license sales change due to advisories.	4.0(1.7)	3.1(1.8)	2.1(1.1)	1.7(0.9)
Extent to which anglers reduce their frequency of fishing.	3.8(1.6)	2.7(1.5)	1.7(1.1)	2.1(1.2)

Table 7. Health advisory evaluation criteria importance ratings according to state, including means and standard deviations.

Evaluation Criteria	NY	PA	OH	MI	IN	IL	WI	MN
	Mean (Standard deviation)							
Extent of awareness of the advisory among licensed anglers.	4.0 (0.8)	4.5 (1.0)	5.0 (0.0)	4.7 (0.5)	4.7 (0.5)	4.7 (0.6)	5.0 (0.0)	3.7 (0.6)
Extent to which anglers are aware if they are fishing for a species with an advisory or not.	4.5 (1.0)	4.2 (1.5)	5.0 (0.0)	4.7 (0.5)	4.5 (0.6)	4.7 (0.6)	5.0 (0.0)	3.7 (0.6)
Extent to which anglers are aware if they are fishing in a body of water with an advisory or not.	4.5 (1.0)	4.2 (1.5)	5.0 (0.0)	4.7 (0.5)	4.2 (1.0)	4.7 (0.6)	5.0 (0.0)	3.7 (0.6)
Extent of angler use of fish cleaning and cooking methods that may reduce contaminants consumed.	3.5 (0.6)	4.7 (0.5)	5.0 (0.0)	4.7 (0.5)	4.2 (0.5)	5.0 (0.0)	5.0 (0.0)	3.7 (0.6)
Extent to which children maintain their fish consumption at or slightly below the levels in the advisory.	3.7 (0.5)	4.5 (1.0)	1.0* (0.0)	4.2 (0.9)	4.5 (0.6)	4.7 (0.6)	5.0 (0.0)	4.7 (0.6)
Extent to which women maintain their fish consumption at or slightly below the levels in the advisory.	3.7 (0.5)	4.5 (1.0)	1.0* (0.0)	4.2 (1.0)	4.5 (0.6)	4.3 (1.1)	5.0 (0.0)	4.7 (0.6)
Extent to which anglers change the size of the fish they keep to avoid larger fish more likely to have accumulated contaminants.	3.2 (1.0)	4.5 (0.6)	5.0 (0.0)	3.5 (1.3)	4.0 (0.8)	4.7 (0.6)	5.0 (0.0)	4.3 (0.6)
Extent to which anglers change the target species they fish for to avoid those species more likely to accumulate contaminants.	3.5 (1.3)	4.5 (0.6)	5.0 (0.0)	3.7 (0.5)	4.0 (0.8)	5.0 (0.0)	5.0 (0.0)	4.3 (0.6)
Extent to which anglers maintain their fish consumption at or slightly below the levels in the advisory.	3.2 (0.5)	4.5 (1.0)	1.0* (0.0)	3.7 (1.5)	4.0 (1.1)	4.3 (1.1)	4.7 (0.6)	4.3 (0.6)
Extent to which anglers practice catch-and-release fishing instead of keeping the fish to eat when fishing for species affected by contaminants.	4.0 (0.8)	4.2 (1.0)	3.0 (2.8)	3.0 (0.8)	4.0 (1.4)	4.0 (1.0)	4.7 (0.6)	4.0 (1.0)
Extent to which anglers change the locations they fish to avoid contaminated waters.	2.7 (1.0)	3.3 (0.6)	4.5 (0.7)	3.5 (1.3)	3.7 (1.2)	4.7 (0.6)	5.0 (0.0)	4.0 (1.0)
Extent of awareness of the advisory among the general public.	2.7 (1.0)	4.2 (1.0)	4.0 (1.4)	3.5 (1.0)	3.7 (1.5)	4.7 (0.6)	4.3 (1.1)	3.0 (0.0)
Extent to which other fish consumers (non-anglers) maintain their fish consumption at or slightly below the levels in the advisory.	3.0 (0.8)	4.5 (1.0)	1.0* (0.0)	3.7 (1.5)	4.0 (1.1)	4.0 (1.7)	4.7 (0.6)	4.3 (0.6)
Extent to which children reduce their fish consumption far below the levels in the advisory.	3.0 (0.8)	3.2 (1.2)	1.0* (0.0)	3.5 (1.3)	3.0 (0.8)	4.3 (0.6)	3.7 (1.5)	3.7 (2.3)
Extent to which women reduce their fish consumption far below the levels in the advisory.	3.0 (0.8)	3.2 (1.2)	1.0* (0.0)	3.5 (1.3)	3.0 (0.8)	4.3 (0.6)	4.0 (1.7)	3.7 (2.3)
Extent to which anglers reduce their fish consumption far below the levels in the advisory.	3.2 (1.2)	3.2 (1.2)	1.0* (0.0)	3.0 (1.6)	3.0 (0.8)	4.0 (1.7)	3.3 (1.5)	3.0 (2.0)
Extent to which other fish consumers (non-anglers) reduce their fish consumption far below the levels in the advisory.	2.5 (0.6)	3.2 (1.2)	1.0* (0.0)	3.0 (1.6)	2.7 (0.5)	4.0 (1.7)	3.3 (1.5)	2.7 (2.1)

Table 7 (continued)

Evaluation Criteria	NY	PA	OH	MI	IN	IL	WI	MN
	Mean (Standard deviation)							
Extent to which fishing license sales change due to advisories.	1.7 (1.0)	2.7 (1.7)	3.0 (2.8)	1.2 (0.5)	3.2 (1.7)	4.0 (1.7)	4.0 (1.0)	2.3 (1.5)
Extent to which anglers reduce their frequency of fishing.	2.5 (1.7)	2.7 (1.7)	3.0 (2.8)	1.7 (1.0)	2.7 (1.7)	3.3 (1.5)	2.7 (1.5)	2.0 (1.7)

*n=1

about the advisories, and extent of behavioral modifications made by anglers (Table 8). The four factors explained 85.9% of the variance. A cluster analysis using the variables included in the factor analysis produced no meaningful clusters related to the differences in importance placed on health advisory evaluation criteria by different agencies or between states. As noted earlier, differences among agencies or states based on health advisory evaluation criteria were less extensive than differences based on advisory objectives.

Most Important Health Advisory Message

We asked respondents to name the most important message to communicate to a potential Great Lakes fish consumer through the health advisory. Fishery agency chiefs said it was important to tell fish consumers that "there are some contaminants in some Great Lakes fish", and emphasized the need to allow consumers to make an informed choice about fish consumption and to include a comparison of fish-eating risks with other risks. Great Lakes fishery program directors expressed concerns similar to agency chiefs, noting the need for risk comparisons, acknowledgment that some fish have contaminants, and that fish consumers should be able to make an informed choice about fish consumption.

Common themes in the responses of health agencies included making people aware that the state is gathering data on which to base sound judgments, that risks from eating fish should be put in proper perspective through the use of risk comparisons, that individual behaviors can be modified to reduce risks, and what the long-term health effects from eating contaminated fish may be. Environmental quality agencies noted the importance of information about changing individual behaviors to reduce risk (similar to health agencies), and the description of health effects related to contaminants. Different from any other agency, environmental quality agencies also noted the importance of including information about the specific chemicals of concern and their concentrations, and the species and locations that are of most concern.

Environmental NGO's placed importance on alerting consumers that exposure to toxic chemicals in fish may cause adverse health effects, describing what risks are associated with eating Great Lakes fish, reminding people that each time a fish is eaten a risk decision is being made, and that society should reduce the level of toxics in the Great Lakes. Industry NGO's placed importance on telling consumers "the truth", and noted that "frequent fish eaters should take care", and that "certain species are comparatively safe to eat".

Positive Aspects of Current Advisories

We asked respondents what they believed were the most positive aspects of the current state health advisories. Fishery agency chiefs noted such strengths as consistency among states for the same body of water (using Lake Michigan as the example), raising public awareness that state agencies are managing the contaminant problems, consistency with commercial risk management since FDA action levels are used as a basis for decisions, that risks are specified for different groups of consumers (e.g., women and children), and that the advisories allow people to learn which species are relatively safer than others. Great Lakes fishery program directors expressed similar notions, including agency consistency (for Lake Michigan), high public awareness, and relative risks for different sizes and species of fish. Additional strengths noted by program directors included information on the health benefits of eating some fish, and the stimulus the advisories may provide to promote pollution clean-up efforts.

Health agencies also noted as strengths that uniform advisories either exist or are in the process of being established, that multiple species are included in the advisories in terms of relative risk, and that advisories present a balanced perspective about benefits and risks. Environmental quality agencies echoed other agencies' perceptions that advisories are consistent

Table 8. Major factors identified and factor loadings for 16 of 19 health advisory evaluation criteria rated according to importance by state agencies. (Three criteria, which focused on general public awareness of advisories, reduction in fishing frequency, and changes in fishing license sales were dropped from the analysis to improve reliability and percent of variation explained.)

Evaluation Criteria	Consumption Maintained at Advisory Level	Consumption Far Below Advisory Level	Angler Awareness	Angler Behavior
Extent of awareness of the advisory among licensed anglers.			.76	
Extent to which anglers are aware if they are fishing for a species with an advisory or not.			.95	
Extent to which anglers are aware if they are fishing in a body of water with an advisory or not.			.93	
Extent of angler use of fish cleaning and cooking methods that may reduce contaminants consumed.			.62	
Extent to which children maintain their fish consumption at or slightly below the levels in the advisory.	.90			
Extent to which women maintain their fish consumption at or slightly below the levels in the advisory.	.92			
Extent to which anglers change the size of the fish they keep to avoid larger fish more likely to have accumulated contaminants.				.83
Extent to which anglers change the target species they fish for to avoid those species more likely to accumulate contaminants.				.87
Extent to which anglers maintain their fish consumption at or slightly below the levels in the advisory.	.93			
Extent to which anglers practice catch-and-release fishing instead of keeping the fish to eat when fishing for species affected by contaminants.	.67			
Extent to which anglers change the locations they fish to avoid contaminated waters.				.78
Extent to which other fish consumers (non-anglers) maintain their fish consumption at or slightly below the levels in the advisory.	.93			
Extent to which children reduce their fish consumption far below the levels in the advisory.		.94		
Extent to which women reduce their fish consumption far below the levels in the advisory.		.93		
Extent to which anglers reduce their fish consumption far below the levels in the advisory.		.90		
Extent to which other fish consumers (non-anglers) reduce their fish consumption far below the levels in the advisory.		.82		

(for Lake Michigan), that relative risks are presented for different species and sizes of Great Lakes fish, and that some advisories are consistent with the risk management decisions made for commercial fish. Environmental quality agencies, however, noted strengths not mentioned by other agencies, including the presence of a comprehensive data base underlying advisories in some states, that the lack of an adequate data base in other states serves as a catalyst to move the state ahead in developing a better data base, and strengths associated with the inclusion of fish preparation and cooking guidelines that can be used to reduce contaminants in fish meals.

Industry NGO's noted such strengths as the inclusion of size considerations, efforts to achieve uniformity, and inclusion of fish preparation guidelines. Environmental NGO's perceived strengths specifically in the Province of Ontario health advisory, and noted that advisories in general provide important reminders that the task of reducing pollution is far from completed.

Negative Aspects of Current Advisories

We asked respondents what they believed were the most negative aspects of state health advisories. Fishery agency chiefs expressed concerns that some people have been driven away from using the resource, that major uncertainties are associated with health advisory risk assessment methods, and that advisories don't explain adequately the risks from eating fish compared with other health risks. Fishery program directors echoed agency chiefs' concerns about uncertainties in the risk assessment methods used and concerns that people have been frightened away. Program directors also noted concerns about an inadequate data base, infrequent updates of advisories, and ineffective communication design.

Health agencies also voiced concerns about major uncertainties in the advisory decision-making process and uncertainties about what constitutes safe versus unsafe levels of contaminants, but overwhelmingly indicated that misinterpretation of the advisory by the public leads to unnecessary avoidance of Great Lakes fish. One health agency also expressed concern about confusion caused by an environmental NGO issuing an advisory different from the state advisory. Environmental quality agencies echoed the health agency concerns about potential confusion resulting from an NGO issuing an advisory, and shared fishery agency concerns that comparative risks were not explained well and that some people may be needlessly scared away from using the resource. Additional concerns of environmental quality agencies focused on the inadequacies of monitoring programs, the potential that current advisory methods may not protect against long-term health effects, and that the advisory may not reach particular groups such as subsistence fishers.

Industry NGO's noted the lack of risk comparisons in advisories, and were concerned about the adequacy of the information base used to develop advisories as well as the uncertainties in the advisory decision-making process. Concern was also voiced about misuse of health advisories by organizations seeking to accomplish their own agendas. Environmental NGO's noted concerns with inconsistent and outdated methods used among states (including inadequate monitoring, inappropriate use of FDA action levels, and lack of consideration of synergistic effects and sensitive groups of people), too little attention paid to advisories by states, and lack of contaminant limits designed to protect not only humans but also wildlife.

We also asked respondents if certain people who should be aware of advisories were not being reached by the current advisory communication efforts. Most respondents indicated concerns that some groups were being missed, including minority populations, non-English speaking anglers and fish consumers, poorly educated anglers, subsistence fishers, urban anglers, illiterate anglers, non-angling consumers or recipients of "gift" fish, unlicensed anglers, young anglers (children), pregnant women, Native American groups, individuals from out-of-state, and consumers of commercially caught fish.

Suggested Advisory Improvements

We asked respondents how advisories could be improved. Fishery agency chiefs desired more interstate cooperation in monitoring and release of advisories including media contacts, more focus on risk comparisons and presentations of risks on a relative scale rather than as absolutes, and inclusion of information about relatively safer fishing locations. Fishery program directors suggested focusing more attention on applying risk management concepts to express risks to laypeople, communicating relative risks, updating the database used, improving monitoring and analysis, using risk assessment rather than action levels, and heralding the benefits of fish consumption.

Health agencies suggested the need to standardize monitoring and analysis methods, the need for a budget to support expanded or simplified explanation and distribution of advisories, needs to improve the databases used, developing consistent methods across jurisdictions, including more information on preparation and cooking techniques, and focusing more on pollution control. Environmental quality agencies felt more information was needed in advisories (e.g., chemicals of concern, how chemicals get into environment and fish), that advisories should be distributed using additional methods besides the fishing regulations guide or media, that fish preparation and cooking methods should be emphasized, that monitoring and analysis methods should be improved and standardized and general procedures made consistent among jurisdictions, that risk comparisons with a focus on relative rather than absolute risks were needed, that health benefits should also be included, and that better general communication methods were needed.

Industry NGO's suggested that one agency should issue all advisories, or at least that there should be uniformity in the message communicated by advisories, that advisories should be written in clear terminology, and that there should be greater public exposure to advisory information. Environmental NGO's suggested changing the methodology used (to, for example, the 1986 EPA cancer risk guidelines), distributing advisories to more people than just sport-anglers, establishing uniform advisories among Great Lakes jurisdictions including the Province of Ontario, adding consideration of other health risks besides cancer, considering the synergistic effects of chemicals, basing health effects projections on quantities of fish eaten by heavy consumers, and using health advisory methods that are consistent with pollution control programs.

Respondents from each group indicated their desire to see the federal government play a stronger role in helping jurisdictions coordinate their health advisory programs.

DISCUSSION

Knuth (1990) outlined a risk communication process related to health advisories that included risk messengers, intended and unintended messages, communication channels, communication filters, and the attitudes and behaviors of the receivers of the information. The agencies examined in this study can all be considered "risk messengers", as producers and/or disseminators of the health advisory information. This study illustrates that the objectives held by Great Lakes risk messengers differ by type of agency and by state. Differences in objectives affect the message sent, the communication channels used, and the ultimate impacts desired on attitudes and behaviors of fish consumers. Groups such as the Great Lakes Fish Consumption Advisory Task Force may be able to stimulate agencies to engage in a discussion of the objectives underlying the health advisory process and their associated strengths and weaknesses. For example, agencies differed in the importance they placed on which subgroups in the human population should be targeted with health advisories. Discussions could focus on the reasons why one group merits more consideration than another. A second example is the higher priority environmental quality agencies placed on helping people select risk-reducing fish preparation methods. Interagency discussion could focus on reviewing the scientific data available about the effects of fish preparation methods on contaminant intake in humans.

One of the Task Force's goals is to work toward common advisory criteria. Definition and selection of such criteria will also be dependent on the underlying objectives agencies hope to achieve through advisories. Because differences in objectives were most pronounced between fishery agencies and environmental quality and health agencies as shown by the cluster analysis, discussions directed toward establishing a shared philosophy about health advisories will need to involve each of these agencies.

Similarities between agencies do exist and should be emphasized. Several objectives were held almost universally by the Great Lakes agencies studied, indicating a shared philosophy for at least some aspects of the health advisory process. All agencies want to allow people to make their own informed decisions and to reduce health risks to special at-risk populations. A common theme included allowing people to compare the health risks from eating Great Lakes fish with the health risks from other activities and foods.

There were fewer differences between agencies regarding opinions about health advisory evaluation criteria than there were about health advisory objectives. Based on the result of the cluster analysis, the differences that did exist regarding evaluation criteria did not appear to be as strongly related to the type of agency or to differences between states as was the case with objectives, but rather reflected characteristics or interests of individual agencies. Overall, however, fishery agencies did rate evaluation criteria related to resource benefits as more important than other respondents, including items such as catch-and-release fishing, reductions in fish consumption far below recommended levels, and fishing license sales. Other agencies (health, environmental quality) should remain sensitive to the mandates and funding sources for fishery management agencies when discussing the health advisory process, as these will affect the objectives and evaluation criteria supported by fishery agencies.

Since most respondents indicated consistency among agencies and states in their health advisory procedures was desirable, it appears support exists for the coordinating work of groups such as the Great Lakes Fish Consumption Advisory Task Force and other efforts to foster discussion and consensus about Great Lakes health advisories. This analysis of the similarities and differences in objectives held by the various agencies and states can serve as a basis for discussing the reasons behind those differences. Once the reasons for differences are known, agencies can consider if it is possible or desirable to modify their objectives to be more in line with those of other Great Lakes agencies. Adopting a common set of objectives is the first major step toward implementing a common health advisory process from monitoring through risk communication and program evaluation.

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